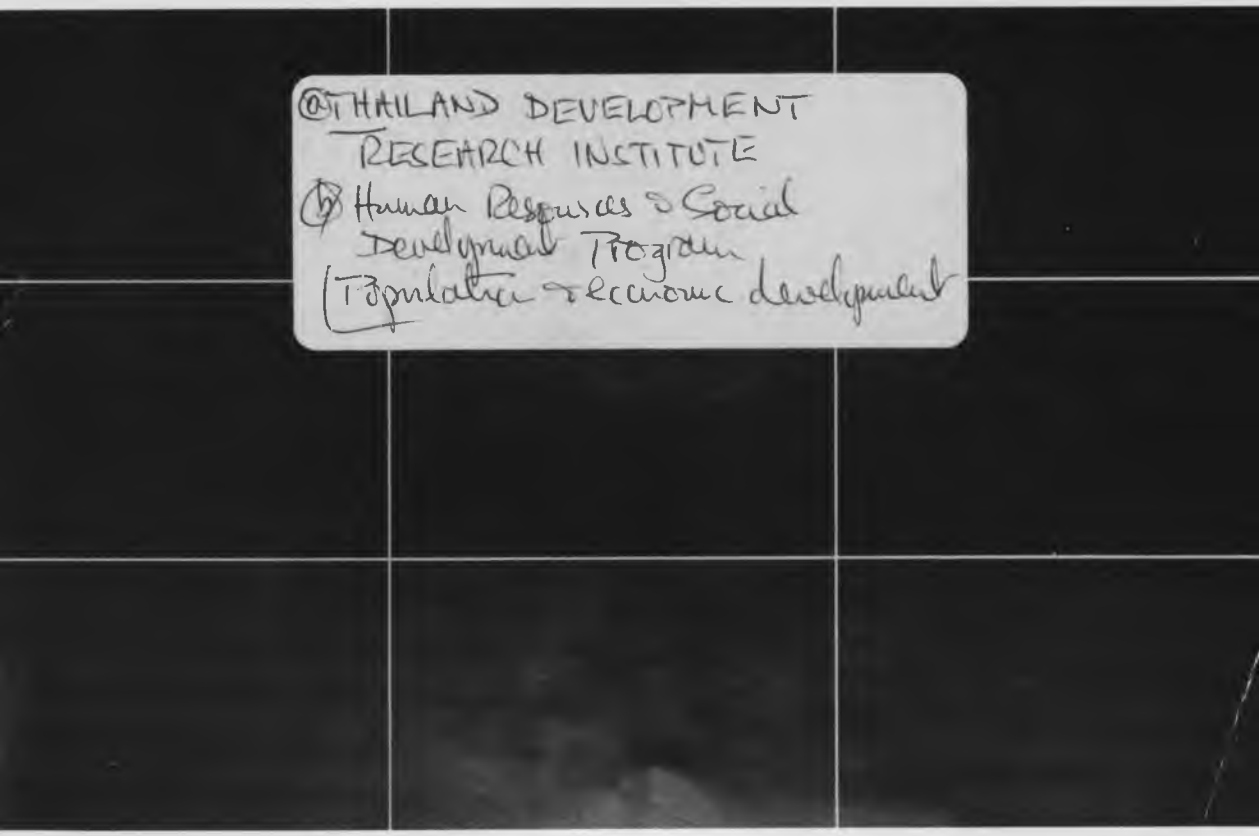
Population and Economic Development in Thailand: Some Critical Household Behavioral Relations

Chalongphob Sussangkarn
Jere R. Behrman
Yongyuth Chalamwong
Mathana Phananiramai
Prapon Pattamakitsakul



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Foreword

This report was prepared by the Human Resources and Social Development Program, Thailand Development Research Institute (TDRI), for Family Health International as part of a project on "Consequences of Fertility Decline in Thailand." A preliminary version of the paper appeared in Thai as Sussangkarn et al. (1988).

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English Executive Summary

The nature of interactions between population and economic development long has been of considerable concern. There have been dire Malthusian prognostics that population growth inevitably eventually leads to subsistence-level standards of living and therefore should be limited by active and direct governmental policies. But there also has been increasing recognition of the complicated interactions between population and development, which leads to much more qualified conclusions about the nature of relations between population and development, and greater appreciation of the need for a good understanding of the basic population-development micro relations in order to predict better developments and to formulate better policies.

This study attempts to contribute to the empirical foundations for the analysis of population-development interactions in Thailand. The Thai experience is of interest not only in itself, but much more broadly because of the combination in recent decades of relatively high rates of economic growth and transformation and of declining rates of growth of population.

This study explores some critical household behavioral relations pertaining to the number of surviving children, post-compulsory schooling demand, household savings, and hours worked by women, based on the 1981 Thai Socioeconomic Survey (SES). These estimates have three purposes.

First, these estimates permit the evaluation of some of the key relationships in the population-development nexus in Thailand. The estimated results indicate a number of important interactions, some of which contrast with conventional wisdom. For example, the standard perception is that women's schooling has much more impact on the number of surviving children and on their education than does men's schooling. However this study finds no significant differences in the impact of men's versus women's schooling on these two outcomes. Another interesting result concerns the differential impact of current income and of longer-run wealth (human as well as physical and financial) on various outcomes, including the opposite effects on savings due to their important role in smoothing consumption over time in light of substantial transitory income fluctuations.

Second, these estimates permit the simulation of the impact of changes in variables such as (1) family planning expenditures, (2) the exogenous component of the determinants of the number of surviving children, and (3) a set of exogenous changes associated with recent Thai economic development experience. These simulations illustrate the nature of the interrelations among the outcomes of interest,

some regional differences in the transmission of the effects, and trade-offs between the number of surviving children and both child schooling and savings rates (and, to a lesser extent, the number of hours worked by women). More specifically, the simulations indicate possible important effects of incremental family planning expenditures and large effects of exogenous changes in the number of surviving children and in the general development process. A simulated exogenous increase in the number of children, for instance, reduces considerably schooling continuation rates and savings rates; hours worked by women are affected less, but still perceptibly. These simulation results demonstrate empirically the complexities of some of the relationships between population and development in the real world context of the Thai experience.

Third, the estimates are important inputs into an economy-wide model of the Thai economy that is under development and that will permit further explorations, beyond those presented in this study, of the nature of population-development interactions. These further explorations will include the investigation of the relevance of various feedbacks and of a number of policies and other changes (e.g., in international trade) that are at least one more step removed from demographic changes, all within the economy-wide framework.

บทสรุป

ลักษณะของความสัมพันธ์ระหว่างประชากรกับการพัฒนาเศรษฐกิจได้รับความสนใจอย่างต่อเนื่องมาเป็นเวลานาน จุดเริ่มของแนวความคิดดังกล่าวเกิดจากการมองโลกในแง่ร้ายของมัลธัส ซึ่งกล่าวไว้ว่า การเติบโตของประชากรจะนำไปสู่สภาวะความเป็นอยู่ที่ฝืดเคืองอัตคัดขาดแคลน การเพิ่มของประชากรจึงควรจะได้รับการควบคุมอย่างจริงจังโดยตรงจากนโยบายของรัฐบาล ความสัมพันธ์ที่ซับซ้อนระหว่างประชากรกับการพัฒนาได้รับความสนใจเพิ่มขึ้นเป็นอย่างมากจากอดีตที่ผ่านมา ความสนใจดังกล่าวนั้นนำไปสู่ข้อสรุปที่เกี่ยวกับลักษณะของความสัมพันธ์ระหว่างประชากรกับการพัฒนาที่ถูกต้องมากยิ่งขึ้นในภายหลัง การที่หลายฝ่ายได้ตระหนักกันมากขึ้นถึงความจำเป็นที่จะต้องทำความเข้าใจกับความสัมพันธ์ดังกล่าวในเชิงจุลภาคนี้ได้ส่งผลให้การพยากรณ์ระดับการพัฒนาและการกำหนดนโยบายต่างๆ สามารถทำได้ดียิ่งขึ้น

การศึกษาครั้งนี้ จึงได้ใช้ความพยายามที่จะเสริมสร้างให้เกิดพื้นฐานที่เด่นชัดในเชิงประจักษ์ต่อการวิเคราะห์ความสัมพันธ์ระหว่างประชากรกับการพัฒนาขึ้นในประเทศไทย ประสบการณ์ที่ได้จากประเทศไทยได้รับความสนใจไม่เพียงแต่เฉพาะตัวของมันเองเท่านั้น แต่ความสนใจดังกล่าวยังขยายออกไปในวงกว้างอีกด้วย ทั้งนี้เนื่องจากในทศวรรษที่ผ่านมาอัตราการเติบโตทางเศรษฐกิจของประเทศโดยเปรียบเทียบแล้วอยู่ในระดับค่อนข้างสูง กอปรกับการเปลี่ยนรูปแบบทางเศรษฐกิจอย่างรวดเร็ว พร้อมๆ กับอัตราการเติบโตของประชากรที่ลดลง

การศึกษาครั้งนี้ได้ทำการตรวจสอบ (explore) พฤติกรรมของครัวเรือนที่สำคัญๆ โดยเฉพาะที่เกี่ยวข้องกับจำนวนบุตรที่ยังมีชีวิตอยู่ อุปสงค์ของการศึกษาหลักเกณฑ์ภาคบังคับ การออมของครัวเรือน ชั่วโมงทำงานของสตรี ในการวิเคราะห์ได้ใช้ข้อมูลการสำรวจภาวะเศรษฐกิจและสังคม ปี พ.ศ. 2524 เป็นหลัก โดยการศึกษาเหล่านี้มีวัตถุประสงค์ที่สำคัญ 3 ประการ

ประการแรก การวิเคราะห์ที่ทำขึ้นนี้ได้ช่วยให้สามารถประเมินถึงความสัมพันธ์ระหว่างประชากรกับการพัฒนาที่สำคัญในประเทศไทย ผลการวิเคราะห์ได้แสดงให้เห็นถึงปฏิสัมพันธ์ที่สำคัญหลายเรื่องด้วยกัน ซึ่งผลที่ได้บางประเด็นแตกต่างจากที่เคยได้ค้นพบมา

แล้วในอดีต ตัวอย่างเช่น มักจะเชื่อกันว่าการศึกษาของภรรยาจะมีผลกระทบต่อจำนวนบุตรเกิดรอดและการศึกษาต่อของบุตรมากกว่าผลกระทบของการศึกษาของสามี แต่จากการศึกษาครั้งนี้หาได้พบเช่นนั้นไม่ เนื่องจากผลที่ได้ชี้ให้เห็นชัดเจนว่าการศึกษาของทั้งสามีและภรรยาที่มีผลต่อการมีบุตรและการศึกษาต่อของบุตรดังกล่าวนั้น มีความสำคัญไม่แตกต่างกัน ผลการวิเคราะห์ที่น่าสนใจในเรื่องอื่นๆ ก็คือ ความแตกต่างของผลกระทบของรายได้และของความมั่นคง (ของทั้งจากมนุษย์ กายภาพ และการเงิน) ต่อการออม อันเป็นผลเนื่องมาจากบทบาทอันสำคัญของการออมที่ไปทำให้การบริโภคในระยะยาวมีความสม่ำเสมอ ทั้งๆ ที่รายได้ที่พึงจับจ่ายใช้สอยมีการขึ้นลงเป็นอย่างมากอยู่ตลอดเวลา

ประการที่สอง การคาดประมาณที่ได้นี้สามารถนำมาทำ "ซิมูเลชั่น" (Simulation) หาผลกระทบของการเปลี่ยนแปลงของตัวแปรต่างๆ ได้ เช่น (1) ค่าใช้จ่ายของการวางแผนครอบครัว (2) ผลกระทบของตัวแปรภายนอกซึ่งเป็นตัวแปรที่กำหนดจำนวนบุตรเกิดรอด และ (3) กลุ่มของตัวแปรที่สะท้อนให้เห็นถึงภาพของการเปลี่ยนแปลงของการพัฒนาเศรษฐกิจของประเทศไทย ผลจากการทำซิมูเลชั่นได้ช่วยชี้ให้เห็นถึงลักษณะของความสัมพันธ์ที่มีต่อกันของผลที่เราสนใจในแง่ต่างๆ ผลที่ได้อันเกิดจากความแตกต่างระหว่างภูมิภาค และผลที่มีต่อทางเลือกระหว่างจำนวนบุตรเกิดรอด การออม และการศึกษาของบุตรโดยเฉพาะอย่างยิ่ง ผลการทำซิมูเลชั่นช่วยชี้ให้เห็นถึงความสำคัญของการวางแผนครอบครัว การลดลงของจำนวนบุตรและกระบวนการพัฒนาโดยทั่วไป ผลการทำซิมูเลชั่นโดยเปลี่ยนแปลงตัวแปรภายนอก เช่น การเพิ่มขึ้นของจำนวนบุตรจะไปลดอัตราการเรียนต่อของบุตรและอัตราการออมเป็นอย่างมาก โดยการเปลี่ยนแปลงดังกล่าวได้กระทบต่อจำนวนชั่วโมงที่มารดาทำงานด้วย แต่ไม่มากนัก ผลจากการทำซิมูเลชั่นเหล่านี้ช่วยชี้ให้เห็นถึงความซับซ้อนในเชิงประจักษ์ของความสัมพันธ์ระหว่างประชากรกับการพัฒนาในโลกแห่งความเป็นจริง โดยอาศัยประสบการณ์จากประเทศไทย

ประการที่สาม ผลการวิเคราะห์ต่างๆ มีความสำคัญอย่างมากในการนำไปใช้เป็นส่วนประกอบในแบบจำลองทางเศรษฐกิจ (Economic Model) และประชากรในระดับมหภาคของประเทศไทย ซึ่งอยู่ระหว่างการจัดทำ และเมื่อเสร็จแล้วจะทำให้สามารถวิเคราะห์ถึงความสัมพันธ์ระหว่างประชากรกับการพัฒนาได้ครบถ้วนกว่าในการศึกษาครั้งนี้

Chapter 1

Introduction

The nature of the interactions between population and economic development has long been of major concern. Aggregate hypotheses that focus on the supposedly strongly detrimental effects of high population growth on development have often been put forth. High population growth is said to worsen development prospects by lowering per capita savings and investment in human resources, capital and natural resources, as well as through other channels. Such analyses have frequently caused alarm or despair about economic development prospects due to the unprecedented population growth rates experienced by most of the developing world in the past four decades. At times, they have led to recommendations, or to the implementation of Draconian population control measures, such as in China. On a broader plane, they have supported subsidization of family planning and other population policies.

Although such views are still common in the popular press and among some policy makers, the perceptions of the links between population and development have undergone considerable change in much of the academic community during the past decade or two. A comparison of the National Academy of Sciences surveys on this topic in 1971 and 1986 highlights this change in perception.[1] In the former, the emphasis is on the detrimental effects of exogenous population changes on economic development prospects, with little sensitivity given to the nature of the underlying microbehavioral relationships or to the feedback of economic changes on population. In the latter, there is much greater sensitivity to the interactions in both directions between population and economic changes and the critical roles microbehavioral responses play in determining the nature of these interactions. As a result, there is far less confidence in conclusions drawn about the obvious negative effects of population growth upon the welfare of those in the developing world. Instead, there is a more subtle appreciation of the complexities inherent in developing sound policies for population and economic development, and of the importance of having a good understanding of the basic underlying microrelations in order to better predict developments.

In this paper, we attempt to contribute to the empirical analytical foundations for analysis of population-development interactions in Thailand. We attempt to do so by estimating some critical household behavioral relations pertaining to the number of surviving children, postcompulsory schooling demand, household savings, and hours worked by women, based on the 1981 Thai Socioeconomic Survey (SES).[2] This exploration enables us to comment on some of the key relationships in

the population-development nexus and to simulate some dimensions of population-development interactions. For example, we simulate separately the impact of changes in (1) family planning expenditures, (2) the exogenous component of the determinants of the number of surviving children, and (3) a set of exogenous changes associated with economic development and experienced during the 1970s in Thailand. Finally, our study also provides some important inputs into an economy-wide model that is under development and with which we will further explore, in future papers, the population-development interactions by focusing on the consequences of the fertility decline in Thailand.

We have organized this paper as follows: First, we briefly discuss the general conceptual framework, and more extensively, how this ties into the data that we use to estimate the relationships of interest. Then, we turn to the estimated relationships. Next, we use these relationships to simulate the developments that would be expected to occur with regard to the number of surviving children, postcompulsory schooling, household savings, and the number of hours worked by women – conditional on alternative assumptions about probable changes in some of the determinants of these variables, which are briefly summarized in the previous paragraph. Finally, we present our conclusions.

Chapter 2

Conceptual Framework and Empirical Representation of Critical Variables

We begin with a brief discussion of the conceptual framework that we use and its implications for estimation. We then consider our representation from the 1981 SES of the four dependent variables of interest. Next, we turn to the representation of the right-side variables in the estimated relationships. Appendix A gives the means and standard deviations for all of our dependent and right-side variables, to which we occasionally refer in discusing these variables.

CONCEPTUAL FRAMEWORK

Our basic framework for specifying the determinants of all four outcomes of interest is consistent with household behavior models in the general spirit of Becker and Lewis (1974), Willis (1973), and Becker (1981). Such a framework yields reduced-form demand relations for outcomes determined by the household in the period of interest as dependent on all relevant exogenous and predetermined prices and assets of the household. Prices should be broadly interpreted to include market and time prices and public-policy-determined social services, such as those related to health and schooling. Assets should also be broadly interpreted to include physical, financial and human resource assets of the household, as well as the broader environment in which the household operates.

The four outcomes of interest in this paper are often conceptualized as being determined simultaneously within a one-period lifetime framework.[3] But there is chronological sequencing among these four outcomes, with the number of surviving children at the start of 1981 determined first; the postcompulsory schooling experience of those children old enough to have decided whether to continue beyond compulsory education at the beginning of 1981 determined next; and household savings and women's hours worked in 1981 determined last. Therefore, we have estimated the determinants of these outcomes to include the possible conditionality of the chronologically later outcome(s) upon the earlier one(s).

If the past outcomes incorporate all relevant past information, ordinary least squares yield consistent and unbiased estimates. However, there is the possibility that earlier decisions were made within a lifetime framework and that all relevant variables are not observed, so that the disturbances in the more recent conditional relations are correlated with disturbances in previous relations. Therefore, we use the Wu (1973) test for simultaneity in our ordinary least squares estimates of the determinants of the schooling continuation rate and of savings; and the Smith and Blundell (1986) test for simultaneity in our tobit estimate of women's hours worked. These tests involve including the predicted residual from an earlier relation in a subsequent one to see if it is significant. For example, the predicted error from the number of surviving children relation is included in the postcompulsory schooling determination relation in addition to the actual number of surviving children; a test for the significance of the coefficient of the former is a test of simultaneity. Essential to identifying the impact of past outcomes on 1981 outcomes and to conducting these exogeneity tests are data on exogenous (to the household) variables over time; those for earlier periods versus later ones permit identification of the impact of the earlier outcomes on the later ones. We have indicated the variables that serve this purpose explicitly at the end of this chapter as part of our discussion of the right-side variables in our relations. But before we turn to that discussion, we will consider our dependent variables.

DEPENDENT VARIABLES

Number of Surviving Children in the Household The SES does not give information on the total number of children ever born to a woman, nor on infant and child mortality. The information provided is the number of surviving children of the spouse of the household head (if the household head is male) or of the household head herself (if the household head is female) residing in the household or away from the household in order to attend school. Table 2.1A gives the mean values of the number of surviving children residing in the household for different age ranges of women for the Kingdom and for the five major regions. For the Kingdom and for every region except one, these means reach a maximum for the 40-44 age range, and then decline for the 45-49 age range. For comparison, Table 2.1B gives data on the number of children ever born by age groups of women for the five regions, based on the 1981 Contraceptive Prevalence Survey. In this table for each region, the maximum number of children ever born is for women in the highest age range—45-49. Thus, at least for women over 45, the SES number of surviving children residing in the household probably is an underestimate of the total number of surviving children, because by the time women have reached that age, their older children have split off to join other households. Therefore, we have limited our sample for the estimates below to women 45 and under. For such women, except in the South, the means do not differ by more than 5 percent between the 1981 SES and the 1981 Contraceptive Prevalence Survey. For the South, the difference is less than 10 percent.

Household Average Postcompulsory Schooling Continuation Rates Our second dependent variable concerns schooling, generally considered to be the most

Table 2.1A Average Number of Living Children in Household Classified by Mother's Age and Region

Age	Total	Bangkok	North	Northeast	Central	South
15-19	0.6900	0.619	0.533	0.826	0.869	0.765
20-24	1.3663	1.017	1.176	1.587	1.244	1.714
25-29	2.1356	1.630	1.920	2.452	1.930	2.511
30-34	2.8451	2.044	2.553	3.235	2.664	3.393
35-39	3.4094	2.774	3.094	3.781	3.389	3.450
40-44	3.6268	3.248	3.219	4.174	3.243	3.889
45-49	3.2904	3.800	2.553	3.905	3.204	2.596
15-44	2.6245	2.060	2.264	3.048	2.523	2.886
15-49	2.7166	2.250	2.301	3.173	2.628	2.844

Source: Socioeconomic Survey, 1981.

Table 2.1B Average Number of Living Children Classified by Mother's Age and Region

Age	Bangkok	North	Northeast	Central	South
15-19	0.600	0.536	0.605	0.727	0.629
20-24	1.101	1.173	1.363	1.346	1.504
25-29	1.570	1.830	2.160	1.852	2.556
30-34	2.213	2.492	3.160	2.762	3.348
35-39	3.045	3.574	4.178	3.660	4.256
40-44	3.304	4.269	5.128	4.297	4.918
45-49	4.069	4.699	5.742	4.799	5.473
15-44	2.178	2.417	2.989	2.590	3.233
15-49	2.322	2.639	3.278	2.818	3.467

Source: Kamnuansilpa and Chamratrithirong, 1981.

important human capital investment affecting economic development and population changes (e.g., World Bank, 1980 and 1981; Colclough, 1982; Psacharopoulos, 1985). Recent estimates of the purely economic returns to schooling in developing countries are quite high, and it is claimed that in addition, there are noneconomic benefits, including some related directly to population. In the case of Thailand, completion of compulsory schooling in recent years has been close to universal. The

sharp demarcation has been between individuals who stop with compulsory education versus those who continue with postcompulsory schooling. We will focus on this critical juncture in our empirical exploration by defining as our dependent variable the proportion of those completing compulsory education in a household who have continued on to postcompulsory schooling. The SES permits calculation of this ratio for all children of the relevant woman in the household who are old enough to have faced this decision and who still reside in the household or are currently away to attend school.[4] Table 2.2 gives the means of the postcompulsory schooling continuation rates that we have calculated from the SES for the Kingdom and the five regions for municipalities, sanitary districts, and villages. The range is from 0.64 in villages in the Northeast to 0.97 in Bangkok sanitary districts, with the mean for the Kingdom of 0.72.[5] The pattern across regions and across degrees of urbanization is what most observers probably would have anticipated a priori, with the highest means generally for the more urbanized subsamples and (in declining order) for Bangkok, the South, the Central Region, the North, and the Northeast.[6]

Household Savings Savings have long been viewed to be important in the development process. In fact, many early models in the Harrod-Domar tradition placed savings at the heart of the analysis, with the growth rate in the simplest such model equal to the average savings rate divided by the incremental capital output ratio. More recent analyses do not focus as much on savings, but savings are still quite important as a major source of investable funds with which to increase the physical capital stock and to limit balance of payments problems. Over the last decade or so average household savings rates in Thailand have declined (see Sussangkarn and Cripps, 1986), a matter of widespread concern. Of course, household savings are only a part of total savings, but they are of interest because they are an important component of total savings.

Women's Hours Worked The hours that women work are a major input into the total labor supply in the economy and are viewed to be intimately related to the determinants of the number of surviving children and their schooling. Participation in the labor market is almost universal for men of working age who are no longer in school. For women, however, prior analysis using aggregate data for Thailand has shown the participation rate to be related to the child dependency ratio (see

Table 2.2 Average Schooling Continuation Rate (Beyond Pratom 4), Classified by Region and Community Type

	Municipal	Sanitary	Village	Total
North	0.93	0.81	0.65	0.68
Northeast	0.82	0.84	0.64	0.66
Central	0.91	0.78	0.68	0.72
South	0.94	0.88	0.75	0.78
Bangkok	0.93	0.97	0.81	0.92
Whole Kingdom	0.92	0.83	0.67	0.72

Source: Socioeconomic Survey, 1981.

Sussangkarn, Ashakul, and Myers, 1986). Therefore, we include the determination of this outcome as the fourth of our major outcomes of interest. We posit that this outcome in 1981 is determined simultaneously with savings, conditional on the predetermined number of surviving children and the postcompulsory schooling continuation rate of those children. For the subsample for which we can estimate the schooling continuation rate—and therefore the subsequent 1981 savings and women's hours worked relations conditional on the schooling continuation rate—women's hours worked averaged 51.8 hours per week. The standard deviation was 22.1 hours per week, reflecting a substantial variance of experience. In fact, about 30 percent of these women reported no hours spent on economic work in the sample period, although these women (as well as most others) spent considerable time on household activities. The majority of these hours worked by the women were as unpaid family workers in household enterprises, particularly (but not exclusively) on farms.

RIGHT-SIDE VARIABLES

Table 2.3 gives more specific details of how we represent the assets and prices (both broadly defined) that affect the four outcomes of interest in our conditional demand relations and our priors about the signs of the estimated coefficients. The data for these variables are from the SES or from a variety of other sources that we linked with the community of residence of each household. Tables A.1 and A.2 at the back of this book give more detail on the abbreviations used in the text and sample distributions of these variables. These variables can be divided into (1) household and individual characteristics, and (2) community characteristics. Some of these characteristics (e.g., income, parental education) are common across the relations, although perhaps with differences in details. Others are specific to particular relations because of the assumed timing or nature of their effects. We follow the organization in Table 2.3 to discuss our a priori interpretations of these variables.

Household and Individual Characteristics

1. Income and assets are presumed to have a positive impact on the number of surviving children, schooling continuation and savings, and a negative impact on women's hours worked. These expectations follow standard assumptions that the number and quality of children, wealth, and women's leisure time are normal commodities that are increasingly demanded with higher incomes. We therefore include household disposable income in each relation in a quadratic form to allow diminishing marginal effects.

The SES includes income for 1981 only. Thus, the income variables are noisy measures of more permanent income, for which a priori would seem more relevant than current income for the determination of the number of surviving children, schooling continuation rate, and women's hours worked. But, as we discuss later, both current income and permanent income could be important for savings. As a result, the estimated income effects are likely to be biased toward zero if we use 1981 income alone. This is one reason why we include other indicators of assets: a wealth

Table 2.3 Specifications of Determinants of Empirical Relations

	Number of Surviving Children	Schooling Continuation Rate	Household Savings in 1980-81	Women's Hours Worked in 1980-81
Household and Individual Variables				
1. **Income and Assets**				
Household disposable income	+ a	+ a	+ a	–
Housing expense and property income	+	+	+	–
Land area	+	–	+	?
Agricultural household	+	–	+	+
Self-employed	+	–	+	+
Cross product of proportion income self-employed and agricultural household			+	
Proportion of household income self-employed	+	–	+	+
Government employee	–	–	–	–
2. **Schooling of Parents**				
Years of schooling - man	+	+	–	–
- woman	+	+	–	+
"Quality" of schooling - man	+	+	–	–
- woman	+	+	–	+
Cross product of man and woman education	+	+	–	–
3. **Demographic Variables**				
Age - man			– a	
- woman	+ a	– a		+ a
Number of household numbers		–	–	+
Ratio of children aged – 0-5			+	–
– 6-11			+	?
– 12-14			+	?
Household head female	–			
Among children who finished compulsory school				
Share of boys		+		
Child spacing		+		
Expected wage impact of schooling given share of boys		+		
Average year of completion		+		
4. **Expenditure Composition**				
Durables share			–	+
Drug and medicine share			–	?
5. **Possibly Endogenous Conditioning Variables**				
Number of surviving children		+	–	–
Schooling continuation rate			–	–

Table 2.3 (continued)

	Number of Surviving Children	Shooling Continuation Rate	Household Savings in 1980-81	Women's Hours Worked in 1980-81
Community Variables				
1. **Schooling** -student/teacher	–	+		
-student/school	–	+		
-teachers' qualifications	–	+		
2. **Health** -medical personnel per capita	?	+		
-proportion piped water	?	+		
-family planning expenditure/ married woman 15-45	–			
3. **Ecomony**				
Proportion of work force - agriculture	+	–	+	+
- white collar	–	+	–	–
Per capita provincial product	+	+	+	?
Shock - in per capita provincial product			+	+
- in local agricultural prices	+			+
Bank deposits per capita			+	?
Average women wages for woman's education	–	+		
4. **Other**				
Electricity in household	–	+	+	?
Proportion Islamic	+	?	+	–
Average number of living children for woman's age	+	–		
Municipality, sanitary district (versus Village)	–	+	–	?
Region (versus Northeast)	–	+	–	?

Note: +, – and ? refer to our priors about the signs of the effects.
a = Linear and squared terms.

measure constructed from housing expenses (under the assumption that such rents and imputations are related more closely to permanent than to transitory income) and other property income; own-land area; and whether the primary source of household income is agricultural, self-employment or government employment. All of these could have income effects a priori in the same directions as discussed above. In addition, however, having land and being agriculturally or otherwise self-

employed have price effects (given transaction costs), which increase the value of children and women working on the family farm or firm; and thus increase the desired number of children and own-enterprise hours worked by women and reduce the children's schooling (since time in school implies less time working). In the case of savings, there might also be a price effect, since household operated farms/firms (whether agricultural or not) are likely to face high interest rates in the informal market[7] and therefore have an incentive for increased savings in order to be able to self-finance investments out of internal funds. Government employees, on the other hand, have pension and health benefits that presumably reduce their incentives for private savings for pension and precautionary purposes.

2. Schooling of parents also represents possibly important household assets, but might also in part have price effects. Usually, the income effect is presumed to dominate for men, with the price effect relatively more important for women – under the assumption that there is more flexibility in the time allocation of women or that the time spent by women in direct income-producing activities tends to be less than for men, so that there is less of an infra-marginal income impact of wage changes for women (e.g., Schultz, 1988b). But the large number of hours worked recorded for women in the 1981 SES suggests that the last point should not hold true for Thailand. If schooling increases productivity in household activities, more educated parents might have children who do better in school because of the better home environment, although this possibility is usually emphasized far more for women than for men, because time allocation studies indicate that the latter spend relatively little time engaged in child care. Schooling might also reflect the genetic endowments of intelligence and motivation, taste effects, or unobserved family wealth or connections. It is very difficult to separate all these effects, although some progress has been made using special data sets or methods. However, there does appear to be a general consensus that more schooling for women tends to be associated with less fertility, fewer surviving children, and more schooled children – all of which are consistent with general conjectures about the value of women's time and the relative prices of child quantity versus quality, and of work time in domestic versus economic activities.

The standard empirical representation of schooling in such studies is by years of schooling. But recent evidence suggests that quality of schooling – as represented by variables such as teachers per student or teachers' qualifications – interacts with years of schooling in affecting outcomes of interest and that the incorporation of this possibility may change significantly the understanding of the empirical impact of schooling.[8] Therefore, we include indicators of the quality of schooling as well as years of schooling for the parents. Models of household behavior, moreover, suggest the possibility of interactions between the schooling of the man and the woman in a household; thus, we also include such interactions. These permit the investigation of the extent to which there is substitution between schooling of men versus women in the determination of the four outcomes of interest.

3. Household demographic variables represent possibly important effects of the size and composition of the household. The size itself, a priori, may affect per capita savings if there are scale economies in consumption[9] and may affect women's hours worked if it relates to child-care options. The share of small children (e.g., ages 0-5), ceteris paribus, probably increases the value of women's time in domestic

relative to economic activities, and thus reduces women's hours worked. Given the control for household size, the shares of children, a priori, would seem to increase savings (although decreasingly so with the ages of the children), since they adjust for the fact that consumption requirements of children normally are considered to be less than those of adults. At the decision juncture for whether to continue with schooling, the sex composition of those for whom such a decision is made may be important if there are differentials in labor market returns by sex, opportunity costs by sex, or biases favoring one sex. We attempt to control for expected wage differentials by sex with a variable that represents the sex-dependent (given the sex composition of the relevant group of children in the household) returns to continuing beyond compulsory education, given local labor market conditions. In case there are differential opportunity costs by sex or simply sex bias, we also include a variable that represents the sexual composition of the relevant group of children in the household. The age variance within this group of children also may be positively associated with the probability of continuing schooling, if there are liquidity constraints, as seems likely. Whether or not both parents are present and whether the household head is female may affect all three outcomes of interest, since they pertain to the expected resources and uncertainties facing the household. Finally, the age of the man and/or the woman may affect all of the outcomes because of life-cycle income, child-bearing and knowledge patterns (which also suggest nonlinear effects, so we use quadratics). Ages are highly correlated between men and women. We use the man's age for savings, since the role of age in this case relates primarily to household life-cycle income and expenditure patterns that are presumed to be tied more closely to the man's than to the woman's age. We use the woman's age in the other three relations – in which the life cycle pattern of her childbearing would seem to be relatively important.

4. Expenditure composition is used to represent possible health shocks (i.e., the share of medicine and drugs) and lumpiness in durable purchases that a priori might reduce per capita current savings and, at least for durable purchases, increase the number of hours worked by women. The effect of a health shock on women's hours worked, however, is ambiguous a priori. Women's hours worked would seem to tend to be reduced if they themselves are ill or if their value in domestic activities is increased due to providing care for other sick household members. On the other hand, sickness of others may put pressure on household income and thus result in the women working longer hours in order to compensate for the lost income.

5. The possibly endogenous conditioning variables on which we focus are two: the number of surviving children and their postcompulsory schooling continuation rate. We posit that the former may condition the latter, and both may condition savings and women's hours worked, since children may be an alternative form of investment for future income and therefore may substitute for financial savings and thus for the need for women to contribute to current income by working.

Community Variables

1. Schooling availability and quality at a local level a priori would seem to affect the effective price and expected returns to time spent in schooling. Limited empirical work for other societies (e.g., Birdsall, 1985) suggests that the quality

effects may be quite important. We posit that these variables affect decisions pertaining to the number of surviving children through a child quality-quantity trade off at the time of decisions relating to fertility and infant and child mortality in the spirit of Becker (1981) and Willis (1973). These variables may also affect the subsequent schooling continuation rate.

2. Health facilities also may have important cross-effects on both the number of surviving children and their schooling by reducing the costs of surviving children and by health-education complementarities. In addition family planning expenditures per married woman aged 15-45 may capture both price and informational effects that reduce actual fertility and thereby the number of surviving children.[10] Because of our interest in the interactions between population and development, one of the simulations that we present in Point 3 below considers the impact of increases in such family planning expenditures on all four of our outcomes.

3. The nature of the local economy a priori may affect all of the outcomes of interest. The structure of the local labor demands and the level of local per capita product are posited to affect the expected return to schooling continuation (since wage returns to schooling are much higher, for example, for white collar than for agricultural work) and thereby fertility-surviving children outcomes. The work options faced by a woman, with possible effects on all four outcomes, are also affected by the nature of the local economy, and are represented explicitly by local wages for her level of education. Cyclical shocks may positively affect short-term savings and women's hours worked; such shocks may also have more permanent effects on the number of surviving children if they occur in the woman's prime childbearing years (her mid-twenties) or at the time of critical decisions concerning schooling continuation. Per capita bank deposits, finally, may be reflective of the extent of local financial market development, and thus affect savings and the time women spend in income generation.

4. Other community variables control for the general infrastructure, taste effects and cultural variations (e.g., proportion Islamic, local average number of children given the women's age), and unobserved effects associated with urbanization (e.g., dichotomous variables for living in municipalities or sanitary districts instead of villages) and with region (e.g., dichotomous variables for residence in each region, with the Northeast as the base). Whether the household is electrified reflects a combination of community effects pertaining to local options and the relative affluence of the household.

Identification

As we discussed previously in this chapter, in order to explore our conditional demand relations, there must be variables determining the number of surviving children that do not directly determine the subsequent three outcomes of interest. There must also be variables determining the postcompulsory schooling continuation rate that do not directly determine 1981 household savings and women's hours worked. If there were not such variables, the endogenous conditioning variables could not be identified. That is, their effects could not be separated from those of the other right-side variables, since they would only be a linear combination of the other right-side variables. These conditioning variables can be identified in part by

exploiting the different timing of the four decisions of interest, and in part by excluding variables that a priori do not seem relevant. To identify the decisions relating to the number of surviving children, for example, we used family planning expenditures per married woman aged 15-45 at the time the woman was in her prime child-bearing years. Once the number of children is determined, this variable would not seem relevant in subsequent decisions except in that it affects the number of surviving children; it thus serves to identify the number of surviving children through which it works indirectly in such decisions. Likewise, the community schooling, health, and some of the economic characteristics at the time that postcompulsory schooling decisions were made are assumed to have no direct impact on 1981 savings and women's hours worked, and thus serve to identify the schooling continuation variable in relation to the savings and women's hours worked.

Chapter 3

Estimated Relations for the Kingdom

We consider the four estimated household behavioral relations one by one, in their chronological order. For each of these estimates we use the specifications discussed in Chapter 2. However, in the interests of simplicity, we will only discuss the final set of estimates after dropping a few variables whose coefficient estimates are not significantly non-zero; their exclusion will not affect the interpretation of the other estimates. All of these estimates are for samples for the entire Kingdom, though the sample for the last three relations is smaller than that for the first. (This is because of the requirement that households have at least one child old enough to have considered postcompulsory schooling in order to be eligible for inclusion in the sample for these outcomes).[11]

NUMBER OF SURVIVING CHILDREN

Table 3.1 gives the final estimates of this relation for 5,821 households in the Kingdom for which the necessary data are available in the 1981 SES. This relation is consistent with about a third of the sample variation in the number of surviving children. We consider the right-side determinants here in the same order that they are presented in Table 2.3 and discussed in the section on right-side variables. Unless otherwise indicated, we refer to a coefficient estimate as being statistically significant if a t-test indicates that it is significant at the standard 5 percent level.

Household and Individual Variables

1. Income and assets: There is a strong quadratic income effect, indicating a positive, but diminishing impact of income on the number of surviving children. However, the maximum income effect occurs at a very high level of household disposable income (about Baht 260,000 per month), so that for income ranges in the sample children are "normal goods". Increasing income by 10 percent at the sample mean, according to these estimates, would increase the number of surviving children by 0.02. While this is not a big effect, its statistical significance is striking for two reasons. First, as noted above, our income measure is for 1981, some time after basic fertility decisions were made and generally implemented in many of the sample

Table 3.1 Regression of Surviving Children

Variable	Coefficient	t-ratio
CONSTANT	- 3.876	- 10.86
DINCOME	5.315E-05	7.26
DINCOME2	- 1.031E-10	- 4.69
WEALTH	- 1.735E-05	- 0.93
TOW	6.006E-03	4.45
AGRI	0.060	1.13
OWNWORK	0.101	2.49
HUEDU	- 0.049	- 3.94
WIEDU	- 0.063	- 3.88
HUWIEDU	1.130E-03	0.67
WAGE	0.372	16.73
WAGE2	- 4.294E-03	- 12.36
HSEXF	- 0.317	- 1.34
NFPP	- 0.022	- 3.82
WWGED	- 9.539E-04	- 0.47
ELEC	- 0.263	- 5.72
PISL	1.040E-04	0.06
MUNI	- 0.104	- 1.40
SANI	- 0.203	- 3.01
BANGKOK	- 0.447	- 4.83
CENTRAL	- 0.382	- 6.37
NORTH	- 0.668	- 13.28
SOUTH	- 0.139	- 1.69
R^2 = 0.3362	SEE = 1.3882	F = 133.50 N = 5,821

households. Even if households had good expectations about their subsequent income at the time that fertility decisions were made (so that the 1981 value is a good indicator of the expectations that were held earlier), our income measure would seem to be contaminated by transitory fluctuations as a representation of permanent income and thus lead to a downward-biased estimate of the income effect. In this connection, it is interesting to note that our effort to include a more permanent income measure in the housing wealth indicator does not yield a significant coefficient. But the land variable does have a small but significant positive impact, indicating that there is an additional 0.06 child for each additional 10 rai, so wealth in the form of land does affect the number of surviving children beyond just the effect of disposable income. Second, despite the a priori assumption that children are "normal goods" and therefore that income should have a positive effect on the number of children, there is seldom empirical evidence of a significant effect (e.g., Birdsall, 1988).

We note further that the kind of income plays a role, as we conjectured might be the case in the section above, due to transaction costs that make children more valuable as workers in household enterprises than in the labor market (as employees). We find that if the primary occupation of the household is own-account, the household has significantly more children (0.101 or more). After controlling for such own enterprise (as well as for land access and for village residence), however, there is not an additional significant effect if the household is primarily agricultural.

2. Schooling of parents: Under the assumption that the income and assets variables control well for income effects, parental schooling represents the combination of price (i.e., the value of time), taste, and endowment effects that are discussed in the previous section. The price and the taste effects usually are presumed, a priori, to have a negative impact on the number of children – particularly for women's schooling – at least in regard to the price effect. To the extent that the endowment effect is associated with labor productivity, it, too, would seem to have a negative "price" impact. Our estimates indicate that years of schooling for both men and women have significant negative effects – though not for the interaction term. An extra year of schooling for the woman is estimated to imply 0.063 fewer children, and an extra year of schooling for the man is estimated to imply 0.049 less children. The point estimate of the schooling effect is larger in absolute terms for women than for men – a result consistent with conventional wisdom. But it should be noted that our estimate for the effect of women's and men's schooling are not significantly different.

3. Household demographic variables: The only significant demographic variable is the quadratic term in women's age. This indicates a positive impact of women's age at a decreasing rate, as would be expected a priori given the increasing exposure to conception over the childbearing years. The maximum impact is estimated to be at a little above age 43, almost the maximum age included in the sample. That the effect of women's age diminishes over their childbearing years might reflect the concentration of childbearing when women are in their twenties and early thirties, but in part may be a control for the likelihood that increasingly more surviving children are living outside of the household as the mother gets older.

Community Variables

1. Health: The only significant community social sector variable for the determination of the number of surviving children is the one that a priori would seem to have the most important direct effect: family planning expenditures per woman of childbearing age at the time that the woman was in her mid-twenties. The estimates imply that the mean level of family planning expenditures reduced the number of surviving children (presumably by reducing unwanted fertility) per household by about -0.12 children, or a little more than 4 percent of the mean actual number of surviving children. Given the distribution of such expenditures over time and space, the impact is larger for younger women and for those in the Northeast and the Central regions. But the impact of such family planning expenditures is not significantly inversely associated with income, as was anticipated in the discussion in the section concerning right-side variables.

2. Economy: We do not find a significant effect from any of the direct measures of the local economy, including the local average woman's wages given her level of education.

3. Other: The only other observed community variable that has a significant effect is the negative one: whether the household has electricity. An increase of 10 percent in the number of households with electricity (and in any associated unobserved characteristics) implies a reduction of about -0.01 in the number of surviving children. In addition, there is evidence of some impact of unobserved community characteristics or selectivity regarding residence associated with the degree of urbanization and the region. Relative to the base subsample of villages in the Northeast, most other localities have fewer surviving children: those who live in sanitary districts tend to have about -0.20 fewer children than those living in villages (or municipalities), and the significant regional effects (relative to the Northeast) are estimated to be -0.38 for the Central Region, -0.45 for Bangkok, and -0.67 for the North. That the South is not significantly different from the Northeast probably is not surprising, though some may attribute the relatively large number of surviving children in the South to the relatively large Islamic population there, which is not indicated as a significant factor in Table 3.1. That the North has significantly smaller numbers of surviving children than do Bangkok and the Central Region, ceteris paribus, is surprising, given the general tendency for the number of surviving children to decline with development and that household disposable incomes are 27 percent higher in the Central Region than in the North, and almost double in Bangkok compared to those in the North.

POSTCOMPULSORY SCHOOLING CONTINUATION

Table 3.2 summarizes the final estimates for this outcome. These estimates are based on the 2,243 households that are included in Table 3.1 and that have at least one child of sufficient age to have decided whether to continue postcompulsory schooling by the start of 1981. The estimated relation is consistent with almost 30 percent of the sample continuation rates.

Household and Individual Variables

1. Income and assets: As for the number of surviving children, disposable income has a significant quadratic effect on the continuation of schooling, implying a positive but diminishing marginal effect of income. The implied maximum income effect is at an income that is about ten times the sample mean, and thus not often observed. At the sample mean, these estimates imply that a 25 percent increase in income causes an increase of only about one percent in the postcompulsory schooling continuation rate. Thus, while the income effect is significant, it is not very substantial. Once again, however, there is the possibility of a downward bias due to transitory income fluctuations. In this case, both the wealth and the land variables have positive significant coefficients,[12] so there is evidence of a wealth effect in addition to the disposable income effect. But, as was the case with the income coefficients, these effects are not very large. A 10 percent increase in both the land and the wealth variables at the sample means implies an increase of only 0.016 in the

Table 3.2 Regression of Schooling Continuation Rate

Variable	Coefficient	t-ratio
CONSTANT	-78.131	- 13.83
DINCOME	7.035E-06	2.43
DINCOME2	- 1.382E-11	- 1.90
WEALTH	1.477E-05	2.12
TOW	1.066E-03	2.26
AGRI	- 0.084	- 4.22
OWNWORK	- 0.011	- 0.70
HUEDU	0.024	4.63
WIEDU	0.030	4.88
HUWIEDU	- 3.593E-03	- 4.88
HHI	- 3.006E-04	- 0.03
RMCPO	0.057	2.66
WINDEX1	6.226E-03	1.35
LEFTCPO	0.040	14.12
F	- 0.063	- 2.39
ERRF	0.038	1.60
SSTTHCPO	- 0.014	- 5.73
ELEC	0.081	4.50
PISL	- 6.174E-04	- 0.79
SANI	0.078	3.06
MUNI	0.029	0.99
BANGKOK	0.050	1.31
CENTRAL	- 0.025	- 0.91
NORTH	- 0.061	- 2.19
SOUTH	0.142	4.14
R^2 = 0.2864	SEE = 0.3265	F = 37.09 N = 2,243

schooling continuation rate. Thus, while parental income and wealth make a difference in the postcompulsory schooling continuation rate, they do not seem to make as strong a difference as in many other developing societies (e.g., Armitage and Sabot, 1987; Birdsall, 1985; King and Lillard, 1983; Wolfe and Behrman, 1984).

As was the case in the determination of the number of surviving children, the source of income seems to make some difference regarding schooling continuation rates. The difference in this case is that receipt of agricultural income rather than own income as the primary source is significant. This is the opposite of the results for the number of surviving children. If the household receives its income primarily from agriculture, the rate for continuing beyond primary schooling drops by -0.084, presumably because of the relatively high opportunity costs of not using such children for agricultural labor.[13]

2. Parental schooling: Both the mother's and the father's years of schooling have a significant positive impact on the schooling continuation probability. If the spouse had no education, the estimates imply an increase in the postcompulsory schooling continuation rate of 0.024 for every additional year of male schooling and of 0.030 for every additional year of female schooling. Although the point estimate is slightly larger for the woman's schooling, once again the difference is not significant; thus, there is no particular support for the conventional wisdom that the woman's human capital is particularly important due to gender differentials in child-care responsibilities. The implied schooling impact is important for both parents, as can be seen by the fact that the estimates imply a greater impact of increasing either one of their schooling by one year (if the other has no schooling) that is larger than the impact of increasing household income by 25 percent or housing and land wealth by 10 percent.

In contrast to the results for the determinants of the number of surviving children, there appears to be a significant interaction between father's and mother's schooling in determining the schooling continuation rate. This interaction implies some limited substitution between the schooling of the parents, so that a higher level of schooling for one parent is more effective in increasing the schooling continuation rate for the children; the lower is the schooling of the other parent. But this effect is small. A one-year increase in the schooling of the mother, for example, increases the continuation rate by 0.030 if her husband has no schooling, but by 0.028 if her husband has six years of schooling. Such substitution, while small, once again raises questions about the validity of the conventional wisdom that the mother's schooling is much more important than the father's schooling in determining child outcomes.

3. Household demographic variables: Two demographic variables have significant effects. The first relates to the composition by sex of the surviving children who have completed compulsory education and therefore were eligible for possibly continuing into postcompulsory schooling. The estimates indicate that male children are more likely to continue; if all of the relevant children are male as compared with all of them being female, for example, the continuation rate increases by 0.057. This is a fairly substantial amount, as can be seen by comparing it with the magnitudes of the effects of increased income and assets and parental schooling. Some might be tempted to interpret this result as prima facie evidence of discrimination against girls. But, if there are gender roles in household production—such as specialization of girls in caring for younger siblings (as Behrman and Deolalikar, 1988a find for Indonesia)—rather than discrimination, this result may simply reflect the higher opportunity costs of girls' time compared to boys' time.

The second significant demographic variable is the average year in which children were at the age for deciding about the continuation of schooling beyond the primary level. The estimate indicates an increase in the rate of continuation of 0.04 with each year. Presumably this variable represents the changing availability of schooling facilities over time (and thus interaction of household demographics with community characteristics) and the changing expectations regarding the returns to schooling.

4. Possibly endogenous conditioning variables: As we discuss in the section concerning right-side variables, we posit a series of sequential choices, so that the schooling continuation rate is conditioned on the previously determined number of

surviving children (but possibly with the intent simultaneously determined). Therefore, we include the number of surviving children as one of the right-side variables in Table 3.2. To test for simultaneity we also include the predicted error from the relation determining the number of surviving children in Table 3.1. The estimates indicate that the postcompulsory schooling continuation rate declines significantly with the number of surviving children in the household. But the Wu test indicates that the number of surviving children is not determined simultaneously with the schooling continuation rate (at least at the standard 5 percent level, though the t-test indicates significance at the 10 percent level). The net effect of these two variables results in a 0.025 decline in the postcompulsory schooling continuation rate with every additional surviving child. Thus there seems to be an important trade-off between the number of children and the quantity of schooling. Children born into larger families are likely to receive less schooling than others; such families are also likely to have lower per capita incomes.

Community Variables

1. Schooling: There is a strong significantly negative effect of one (inverse) index of schooling quality: the number of students per teacher at the secondary level at the time that the postcompulsory schooling decisions were made. The estimates imply that a 10 percent increase in this variable at the sample means would reduce the continuation rate by about 0.04. Thus schooling quality apparently is an important and substantial determinant of schooling continuation, as one would expect a priori, and as is reported in at least one other developing country context (e.g., Behrman and Birdsall, 1983 and 1985; Birdsall, 1985). We do not find evidence, however, of a significant effect of schooling quality on the number of surviving children, as would seem to be implied by the "quantity-quality" fertility model.

2. Other community variables: The only observed community variable with a significant coefficient for the determination of the number of surviving children is the presence of electricity. In this case, the estimated effect is positive and implies that a 30 percent increase in this variable (and in the unobserved associated characteristics) at the sample mean would increase continuation rates by about 0.01. The dichotomous variables for urbanization indicate that residence in a sanitary district increases the continuation rates by a significant 0.078 compared to residence in a village, but that residence in municipalities does not have an effect different than residence in villages; this latter result parallels the one for surviving children and is also probably somewhat surprising. The additive regional dichotomous variables also are slightly surprising in that they imply that once all of the observed right-side variables already discussed are controlled for, only the South has significantly higher continuation rates (by 0.14) than the Northeast, and those in the North are significantly lower (by 0.06) than the Northeast. The difference in the South, as with surviving children, does not seem to be due to the much higher representation of Islam in the population, since this variable again is insignificant.

HOUSEHOLD SAVINGS

Table 3.3 gives our estimates of the conditional demand functions for household savings in 1981. The sample is the same as that for Table 3.2. The estimated relation is consistent with a little over 90 percent of the sample variance.

Table 3.3 Regression of Savings

Variable	Coefficient	t-ratio
CONSTANT	640.224	0.55
DINCOME	0.666	49.00
DINCOME2	5.750E-07	17.04
WEALTH	- 0.994	-31.25
TOW	- 0.227	- 0.10
AGRI	- 148.306	- 1.10
SOWNAGRI	1046.303	4.47
SHOWN	- 575.661	- 3.24
GOVERN	- 386.268	- 3.08
HUEDU	- 61.034	- 2.47
WIEDU	31.655	1.06
HUWIEDU	- 12.894	- 3.61
MAGE	- 51.793	- 1.17
MAGE2	0.510	1.07
HHI	- 243.053	- 4.99
RCH05	1171.437	4.91
RCH6	893.482	5.05
RCH12	309.889	1.72
SHDUR	-3870.704	-20.43
SHMEDC	-3417.260	-10.12
F	29.485	0.23
ERRF	3.194	0.03
RCPO	- 442.845	- 1.33
ERRCPO	236.266	0.68
RGPPS	749.116	1.62
PISL	6.781	1.93
SANI	- 127.970	- 1.08
MUNI	- 590.061	- 4.41
BANGKOK	-1093.098	- 7.01
CENTRAL	- 736.244	- 6.52
NORTH	- 67.080	- 0.57
SOUTH	- 762.137	- 5.17
R^2 = 0.9266	SEE = 1469.26	F = 900.53 N = 2,243

Household and Individual Variables

1. Income and assets: Savings permit the consumption stream to differ over time from the income stream, as well as the acquisition of wealth for precautionary and bequest purposes. Savings almost always, therefore, are posited to be positively dependent on current income. If current income is controlled for, they may be negatively associated with indicators of longer-run wealth. The higher one's wealth, ceteris paribus, the less attractive it is to forego current consumption (by saving out of current income) to increase future consumption, bequests, and precautionary balances.

Our estimates reflect these patterns. The quadratic in disposable income is highly significant, with a slightly increasing marginal propensity to save as income rises. At very low income levels, the marginal propensity to save is estimated to be 0.666, with an increase to 0.670 at the sample mean income. This may appear to be a high marginal savings propensity. But it is consistent with the permanent income hypothesis that transitory income is largely saved if there are large transitory components in observed household income. Moreover, usual estimates do not control for the negative effects of previously accumulated wealth, given income, which biases downward the estimated savings propensity to the extent that the observed income has some permanent component that is positively associated with wealth.

Our estimates indicate that the negative effects of wealth on savings are important, with a strong negative effect of the indicator of previously accumulated wealth, though not of land. For households whose major source of income is government employment, moreover, there is an additional negative effect. This is consistent with a negative wealth effect, because governmental employment gives entitlement to a pension and health insurance for the whole family.[14] The share of income from own enterprise also has a significantly negative coefficient, perhaps for similar reasons. If the own enterprise is agricultural, however, the net effect is positive, probably due to the need for self-financing given poor rural capital markets, as was suggested in the section on right-side variables in Chapter 2.

2. Parental schooling: The coefficient estimates for the man's schooling and for the interaction term between the man's and the woman's schooling are both significantly negative (that for the woman's schooling is insignificantly positive). These are consistent with the observation that human capital is another form of wealth; with higher human capital in the form of adult schooling, there is the likelihood of a higher future income stream and therefore less need for current savings. The significant interaction term (with the same sign as that of the significant coefficient on man's schooling) suggests that there is complementarity between the schooling of the man and of the woman in regard to assuring a future income stream.[15]

3. Household demographic variables: These variables indicate a significantly negative effect of household size and significantly positive effects of the shares of the household that are children, with the latter effects declining with the age of children. The negative effect of household size presumably merely reflects that if a given level of income is spread over the consumption of more household members, less is likely to be saved. The positive effects of the shares of children in the household appears to be an adjustment for consumption needs or requirements (e.g., with regard to nutrient consumption) that increase with age. The larger the

proportion of small children in the household, the less the required consumption and the greater the potential for savings out of a given disposable income per household member.[16] The quadratic in age, finally, does not have significant coefficients and thus does not provide support for there being important lifecycle patterns beyond those captured by other variables (e.g., the relation between the current income and the wealth indicators).

4. Expenditure composition: The two types of expenditure have significantly negative effects on savings, a result that is consistent with the a priori discussion in Chapter 2. The negative effect of the expenditure share of medicine and drugs suggests that illness shocks reduce (current) savings. The negative effect of the expenditure share of durable suggests that the lumpiness of durable purchases transitorily reduces savings.

5. Possibly endogenous conditioning variables: These are both the number of surviving children and the postcompulsory schooling continuation rate, both of which are posited to be determined prior to the 1981 SES. Also included are the predicted values of the disturbances for these two variables, based on the estimates in Tables 3.1 and 3.2, in order to test for simultaneity. None of these four variables has a statistically significant coefficient estimate in Table 3.3. Therefore, per capita household savings appear to be independent of the number of surviving children and of the schooling continuation rate (although the number of surviving children will indirectly influence savings through its impact on household size).

Community Variables

1. Economy: There is a significant (at the 10 percent level) effect of local economic shocks on savings. This is consistent with a relatively high level of savings out of transitory income, as conjectured in the permanent income hypothesis as well as with our estimated coefficients of the marginal propensity to save, which we discuss above.

2. Other community variables: The only other observed community variable that is statistically significant is the positive effect of the proportion of the population that is Islamic. The dichotomous urbanization variables indicate significantly less savings in municipalities than in villages, but no difference between sanitary districts and villages. The dichotomous regional variables indicate, ceteris paribus, substantially less savings per capita in Bangkok than in the Central Region and the South, and substantially less savings per capita in the Central Region and the South than in the Northeast and the North. Such a pattern may reflect the relative lack of capital markets on which households can depend in more traditional areas, or the more materialistic lifestyle in the cities.

WOMEN'S HOURS WORKED

Table 3.4 gives our estimates of the conditional demand function for women's hours worked in 1981. As we discussed in Chapter 2, we consider that the decision about these hours worked to be determined simultaneously with the decision about household savings, and that both are conditional on the predetermined number of surviving children and schooling continuation rate. Therefore, the sample and the

Table 3.4 Tobit Estimates of Number of Hours Worked by Women

Variable	Coefficient	t-ratio
CONSTANT	-32.488	-0.85
DINCOME	0.714E-03	2.33
DINCOME2	- 0.137E-08	-2.13
WEALTH	- 0.138E-02	-2.49
TOW	0.278E-01	0.53
AGRI	5.120	2.90
OWNWORK	7.954	5.70
GOVERN	- 7.332	-3.70
HUEDU	- 0.724	-1.65
WIEDU	0.759E-01	0.13
HUWIEDU	0.114E-01	0.21
WAGE	4.066	1.60
WAGE2	- 0.498E-01	-1.59
HHI	2.151	2.64
RCH05	- 7.322	-1.66
RCH6	5.492	1.72
RCH12	1.567	0.49
SHDUR	- 3.706	-1.06
SHMEDC	- 4.793	-0.79
F	- 4.856	-0.98
ERRF	2.256	0.46
RCPO	2.133	0.34
ERRCPO	- 1.386	-0.21
RGPPS	1.086	0.12
PISL	- 0.108	-1.55
SANI	- 4.856	-2.28
MUNI	-14.902	-7.44
BANGKOK	-12.153	-4.07
CENTRAL	2.557	0.91
NORTH	- 0.488	-0.13
SOUTH	2.050	0.75

right-side variables in the relation for women's hours worked are basically the same as for the savings relation. Because there are many women who report zero hours worked during the reference period,[17] we present tobit estimates of the women's hours worked relation in this table.

Household and Individual Variables

1. Income and assets: The coefficient estimate for the disposable income variable is significantly positive (though the quadratic term is not), suggesting a small

association between women's hours worked and income (i.e., a 10 percent higher income at the sample mean is associated with an increase in the number of hours worked by women of about 0.2 hours per week). This association poses some problem of interpretation because of possible simultaneity between household disposable income and the number of hours worked by women, as the income that women derived from working is part of the household disposable income. It would have been better, if possible, to exclude the woman's income. However, where the woman is an unpaid family worker in the household enterprise (which is true for the majority of women in the rural areas), her income is not separately reported, so one can only exclude the income of women who are employees. This would also introduce bias into the estimates. Therefore, for consistency with the other relations, we present in Table 3.4 the estimates with disposable income.

The estimates of the impacts of other income- and assets-related variables, however, are more interesting than are the estimates of the current-income variables. These indicate some important wealth/income and price effects.

There are three variables, as we discussed above, that primarily indicate wealth. Two of these, the wealth indicator (housing expense and property income) and household head having government employment, have significantly negative coefficient estimates. These estimates suggest that in wealthier households, women desire more leisure. While the magnitude of the housing wealth indicator is not very large (i.e., a 10 percent increase in this variable is estimated to reduce women's hours worked per week by less than 0.06 hours), the impact of the fact that the household head has a relatively assured income stream as well as the health and pension benefits of government employment are estimated to cause a substantial decline of 7.3 hours in the number of hours worked by women.

The two variables that we interpret to represent price effects pertain to: (1) whether the household operates its own enterprise as the major source of its income; and (2) if so, whether that enterprise is primarily agricultural. As we discussed in Chapter 2, the price effect is due to the fact that these activities lower the costs (or increase the benefits) of having family members, including women, to work in the household enterprise. The estimates in Table 3.4 indicate that these effects are important indeed. If the major source of income for a household is a nonagricultural household enterprise, women work 8.0 more hours per week than if a household enterprise is not the major source of household income. If the major source of household income is also from agriculture, women work 13.1 more hours per week than do women in households in which the major source of income is not from work in the household enterprise.

2. Parental schooling: For the savings estimates we argue that the significant impact of men's and women's schooling on savings probably reflects the dominance of a wealth effect, as do some of the other estimates in that relation. With regard to the number of hours worked by women, however, in addition there are a number of other possible effects, which were discussed at some length in the section on right-side variables in Chapter 2. The one on which economists usually focus is a price effect, in which more schooling for women is thought to increase their marginal productivity in economic activities more than in noneconomic activities, and thus increase the price for work in economic activities. The estimates in Table 3.4 indicate that neither men's nor women's schooling (nor the schooling interaction) has a

significant impact on the number of hours worked by women. This result for women's schooling is consistent with the income/wealth effect and more or less offsets the price effect just described. For men's schooling, however, this particular price effect is not operative, so some other factors must underlie this result.

3. Household demographic variables: Household size, which negatively affects savings, positively affects the number of hours worked by women, with an increase of 2.2 hours per week for every additional household member. As for savings, this plausibly reflects the added pressure on resources for given levels of income and wealth. In addition, a larger household provides more individuals to perform various domestic tasks, including child care. The variables pertaining to the importance of children of different age groups in the composition of the household, however, seem to reflect something different in the women's hours-worked relation than in the savings relation, (where we interpret them to be correcting for the lesser consumption requirements or needs of smaller children). Were they playing the same role as in the savings relation, we would expect the same relative magnitudes with the opposite sign pattern in the hours-worked relation as in the savings relation. Instead, in the hours-worked relation, we find that none of the coefficient estimates for children in the age groups is significant.

The other demographic variables pertain to the quadratic in women's age. The point estimates imply that the number of hours worked by women increases until they reach a maximum at about age 41; it then declines for older women. Such a pattern is consistent with a priori expectations and with empirical evidence from other similar economies (e.g., Behrman and Deolalikar, 1988a on Indonesia). But, somewhat surprisingly, the estimates are not significantly non-zero. Perhaps as we conjectured for household savings, other variables (such as those that represent income-wealth relations) represent lifecycle phenomena in these estimates.

4. Expenditure composition: These expenditure shares may represent health shocks and lumpiness of durable purchases, as in the savings relation. But, as we discussed previously, the a priori anticipated sign for the health expense variable is ambiguous. We find that neither of these has a significant effect on the number of hours worked by women. Apparently, in response to such health shocks and the lumpiness of durable purchases, the adjustment is in savings, but not in the number of hours worked by women.

5. Possibly endogenous conditioning variables: As in the savings relation, neither the number of surviving children nor the schooling continuation rate nor the predicted residuals for either is significantly non-zero in the relation for women's hours worked. Thus, both of these outcomes for 1981 seem to be independent of the predetermined variables pertaining to the number and schooling of children—at least once there is control for the household demographic variables already discussed. In both relations, the true effect of the number of surviving children may be obscured by the control for household size, since the sample correlation between these two variables is 0.91. If so, there remains the question as to why household size has significant coefficient estimates in these two relations and not for the number of surviving children—if in fact the latter is important.

Community Variables

We find that the number of hours worked by women was not significantly affected by any of the observed community variables, including that for current economic shocks (which increases savings significantly at the 10 percent level of significance). All of the significant regional and urbanization effects seem to pertain to the degree of urbanization, not to regional differences. None of the latter differ significantly from the Northeast, except -12.2 hours worked per week in Bangkok compared to elsewhere. In addition, there is a significant reduction of -14.9 hours per week for those residing in municipalities and -4.9 hours per week for those residing in sanitary districts. Thus, there seem to be some important effects inversely associated with the extent of urbanization (additional to the fairly large effects of whether the household is basically agricultural).

Chapter 4

Partial-Equilibrium Simulations of Implications of Estimates

To understand the full implications for the interaction of population and development of our estimates of the key household determinants (i.e., number of surviving children, the postcompulsory schooling continuation rate, household savings and the number of hours worked by women) would require that they be embodied in a full economy-wide, dynamic model of Thailand. Such an effort is beyond the scope of the present paper. However, the implications of these relations can be assessed by conducting partial-equilibrium simulations of what they imply given a set of changes in the right-side variables. We undertake three sets of such simulations involving the following changes: (1) a doubling of family planning expenditures, (2) an increase in the exogenous component of the determinants of the number of surviving children, and (3) a set of exogenous changes associated with economic development and experienced in a recent decade on the set of four interrelated outcomes of interest. Consider each of the simulations in turn.

INCREASED FAMILY PLANNING EXPENDITURES

The most-emphasized direct policies for affecting fertility, and therefore the number of surviving children, pertain to family planning. For our first simulation we ask what would be the impact of doubling family planning expenditures. Such expenditures directly affect the number of surviving children in the relation (see Table 3.1), and – through the number of surviving children – also may alter the other outcomes of interest.

Table 4.1 summarizes the results of this simulation by giving the impact of the change on the regional and Kingdom averages for the four outcomes of interest. This table also gives the induced percentage changes in each of the four outcomes as compared to base simulations in which every variable is assumed to have the mean value for that particular region (or for the Kingdom as a whole).

The simulation results indicate that the effects generally are in the direction that we would anticipate a priori: decreases in the number of surviving children and increases in the schooling continuation rate and the average savings rate. It is noteworthy that the schooling continuation and the savings rates are affected perceptibly even though changes in family planning have no direct impact on these

Table 4.1 Simulated Changes in Number of Surviving Children, Schooling Continuation Rates, Savings, and Number of Hours Worked by Women (Double Family Planning Expenditure)

	North	Northeast	Central	South	Bangkok	Kingdom
Percentage change in:						
Number of surviving children	-4.46	-3.69	-6.23	-3.88	-4.72	-4.39
Post-primary schooling rate	1.38	1.52	2.00	1.33	1.33	1.50
Women's hours worked	0.77	0.82	1.18	0.88	1.74	0.93
Increase in:						
Saving rate (%)	0.76	1.00	1.01	0.73	0.45	0.81

relations – only the indirect effects through the number of surviving children. This result points to the dependence of subsequent family decisions on the number of surviving children. It also points to significant trade-offs between the number of children on the one hand and both their schooling and household savings (for physical and financial asset accumulation) on the other.

We also note that there are some important regional differences. The percentage changes in the number of surviving children are simulated to be relatively large in the Central Region. The indirectly induced changes in the schooling continuation rates and savings follow the same general regional patterns, with the largest change in the Central Region. However, the details differ by region.

A final question is whether the induced changes are large. The answer to this question depends upon whether the exogenous change in family planning expenditures is viewed as large or not. If one characterizes it as a doubling of resources devoted to family planning, that seems to be a large change, and the impact on the four outcomes may be characterized as fairly small. On the other hand, it also is accurate to characterize the same change as an increase of only six baht per married woman aged 15-45 per year, which does not seem to be a very large increment in family planning expenditures. Given this latter characterization, changes in family planning expenditures might be described as being fairly effective to have such a simulated impact on savings and on the number of surviving children and, to a lesser extent, schooling and the number of hours worked by women.

EXOGENOUS INCREASE IN THE NUMBER OF SURVIVING CHILDREN

We have argued in this paper that important determinants of the number of surviving children include variables such as those that are in our estimated relation in Table 3.1. Therefore, it would be inappropriate to analyze the relation between population and development as if population somehow were determined completely exogenously. However, a considerable portion of the variance in the number of surviving children across households is not explained by our estimated relation and thus can be considered to be exogenous from the point of view of our analysis. It is interesting to ask what would have happened to our four outcomes if that exogenous determinant of the number of surviving children were different. To be more specific, we ask what would have been the implications if the exogenously-determined number of surviving children had been one child per household larger than that actually experienced. This simulation can be viewed as approximating the answer to the counter-factual question: what would have happened to our four outcomes if there had not been a large drop in fertility for reasons beyond those captured in our specification in the past decade or so.

Table 4.2 summarizes this simulation. The exogenous change implies for the Kingdom a 34.3 percent increase in the number of surviving children (for women between the ages of 15 and 45). This induces drops of 8.9 percent in the schooling continuation rate and of 5.6 percent in women's hours worked, and a substantial decline of 4.8 percent in the average savings rate. The effects are widespread across all of the regions, though the differential regional conditions once again cause some variation in the magnitude of the changes in the subsequent outcomes that are induced by the hypothesized increase in the number of surviving children. But the basic result for each region and for the Kingdom is a substantial reduction in development prospects due to population increases and declines in schooling, number of hours worked, and savings.

Table 4.2 Simulated Changes in Number of Surviving Children, Schooling Continuation Rates, Savings, and Number of Hours Worked by Women (Increase Surviving Children by One)

	North	Northeast	Central	South	Bangkok	Kingdom
Percentage Change in:						
Number of surviving children	38.91	29.85	35.59	31.59	42.31	34.31
Post-primary schooling rate	-9.27	-9.78	-8.96	-8.27	-6.92	-8.93
Women's hrs. worked	-5.16	-5.25	-5.27	-5.47	-10.68	-5.57
Increase in:						
Saving rate (%)	-5.12	-6.46	-4.52	-4.50	-2.76	-4.84

EXOGENOUS CHANGE IN GENERAL DEVELOPMENT

All of our relations have various right-side variables that are affected by the general process of development. We explore the impact of the general development process on these outcomes by simulating the effects of a set of changes that approximate those experienced in a recent decade in Thailand. Specifically, based on observed changes between the 1970 and the 1980 censuses and other sources covering the same period, we consider the impact on the four outcomes of changes in variables pertaining to income and wealth, occupational structure, education of the parents, school quality, family planning expenditures, and other community variables such as the regional distribution of households. The exogenous changes are indicated in Table 4.3. Since the base year for our analysis is 1980 (from the 1980-81 SES), we indicate in this table and in our simulation below the changes in 1970 viewed from the perspective of 1980.

Comparing the data from 1970 to 1980, we found the following differences:

- Mean real disposable income per household was 20 percent lower in 1970 compared to 1980.
- We assumed that real wages were also 20 percent lower.
- Income from property was 12 percent lower.
- The proportion of households in agriculture was 15 percent larger in 1970.
- The proportion of households in self-employment was 7 percent greater in 1970. This was also assumed to be the case with the share of household income from self-employment.

Table 4.3 Percentage Change of Exogeneous Variables for General Development Simulation

Variable	Change from 1980 to 1970
DINCOME, WWGEDU, WINDEX1	-20
WEALTH	-12
AGRI	+ 15
OWNWORK, SHOWN	+ 7
GOVERN	-50
HUEDU	- 5
WIEDU	-13
SSTTHCPO	-15
NFPP	-56
RGPPS	+ 7
ELEC	-70
SANI	- 1
MUNI	-27
NORTH	+ 4
SOUTH	+ 3
CENTRAL	+ 4
BANGKOK	-22

- The proportion of government employee households was 50 percent less in 1970.
- Education of the husband was 5 percent lower, and that for the wife was 13 percent lower.[18]
- Student-to-teacher ratio at the secondary level was 15 percent less in 1970.
- Public family planning expenditures per woman (15-45) was 56 percent lower in real terms.
- Real GDP shock (compared to the trend) was 7 percent larger in 1970.
- The proportion of households having electricity was 70 percent less in 1970.
- The proportion of households in sanitary districts was one percent less.
- The proportion of households in municipal areas was 27 percent less.
- The proportion of households in the North was 4 percent greater.
- The proportion of households in the South was 3 percent greater.
- The proportion of households in the Central Region was 4 percent greater.
- The proportion of households in Bangkok was 22 percent less.[19]

The results of the simulations from changing the exogenous variables according to Table 4.3 are given in Table 4.4. This table reproduces the parameter estimates for each equation and gives the means for the right-side variables in the base situation (the 1981 SES), and for the simulation. The last column (labeled "CHANGE") gives the difference between the product of the difference between the simulated and SES means and the parameter estimate (for each right-side variable). For each equation, the table also gives the predicted values for the dependent variable in the original estimate and in the simulation, as well as the differences.[20]

With changes in the right-side variables to approximate the situation a decade prior to the 1981 SES, the simulations imply increases in the number of surviving children and the number of hours worked by women, and declines in the schooling continuation rate and in the savings rate. The directions of all these changes conform to what actually happened in Thailand between 1970 and 1980.

According to the censuses, the mean number of children ever born alive per married woman aged 15-44 declined from 3.725 in 1970 to 2.828 in 1980.[21] This fertility change will be reflected in a decline in the mean number of children still living per married woman between the same years. Our simulation (representing a decade prior to 1981) shows a slight increase of 0.18 children per women (6.2%) in 1970 compared with the base prediction (1981). Except for income, all the major changes in the right-side variables lead to greater fertility in the simulation for 1970 compared with the base-changes in the education of men and women (and the interaction term), the occupational structure, wages, public family planning expenditures, availability of electricity, and locational factors (combined). While there are no data on changes in the mean number of living children per woman from the census, it is likely that our predicted change (although in the right direction) underestimates the actual change.[22] This is probably due to factors not taken into account in the estimates (e.g., changes in tastes such as increased parental consumption of goods and services instead of spending on children and lessened expectations of old-age pension gains from having children with the growing wealth in other physical, financial and human assets).

Table 4.4 Simulation of General Development Fertility

Variable	Coeff.	Mean Whole Kingdom 1980	Mean Whole Kingdom 1970	Change
Constant*	-3.8761			
DINCOME*	0.0001	3296.2500	2648.5369	-0.0344
DINCOME2*	-1.0306E-10	1.0865E + 07	7.0147E + 06	0.0004
WEALTH	-1.73548E-05	403.6000	355.1680	0.0008
TOW*	0.0060	9.3870	9.3870	0.0000
AGRI	0.0596	0.6275	0.7227	0.0057
OWNWORK*	0.1011	0.4876	0.5223	0.0035
HUEDU*	-0.0492	4.5790	4.3725	0.0102
WIEDU*	-0.0626	4.0056	3.4801	0.0329
HUWIEDU	0.0011	18.3416	15.2165	-0.0035
WAGE*	0.3718	31.9824	31.9824	0.0000
WAGE2*	-0.0043	1022.8739	1022.8739	0.0000
HSEXF	-0.3169	0.0061	0.0061	0.0000
NFPP*	-0.0219	5.7663	2.5597	0.0703
WWGEDU	-0.0010	17.9672	14.4366	0.0034
ELEC*	-0.2632	0.4449	0.1344	0.0817
PISL	0.0001	4.6916	4.6916	0.0000
MUNI	-0.1044	0.1516	0.1109	0.0043
SANI*	-0.2027	0.0961	0.0956	0.0001
BANGKOK*	-0.4474	0.1290	0.1011	0.0125
CENTRAL*	-0.3820	0.1657	0.1723	-0.0025
NORTH*	-0.6675	0.2401	0.2502	-0.0067
SOUTH*	-0.1385	0.1272	0.1314	-0.0006
F^ (Simulation)		2.8800	3.0580	0.1780
% CHANGE F^				6.18

The simulation results show a substantial decline in the predicted post-primary schooling continuation rate in 1970, compared with the base prediction: 27.4 percent compared with 70.7 percent. Apart from the decline in the student-to-teacher ratio at the secondary level compared to the base, all the other changes[23] lead to lower schooling continuation in the simulation. By far the largest impact, however, is due to the average year in which it was decided whether the children in a household continued beyond grade 4. This is basically a time trend representing in large part the greater availability of schools over time and perhaps higher expectations regarding the returns to schooling. The other changes combined lead to a decline in the continuation rate of 3.3 percent. Among these other changes the indirect impact of

Table 4.4 (Continued) Schooling Continuation Rate

Variable	Coeff.	Mean Whole Kingdom 1980	Mean Whole Kingdom 1970	Change
Constant*	-78.1310			
DINCOME*	7.0346E-06	3827.0606	3075.0432	-0.0053
DINCOME2*	-1.3823E-11	1.4646E+07	9.4559E+06	0.0001
WEALTH*	1.4772E-05	464.0079	408.3270	-0.0008
TOW*	0.0011	13.0412	13.0412	0.0000
AGRI*	-0.0837	0.6593	0.7593	-0.0084
OWNWORK	-0.0110	0.5303	0.5681	-0.0004
HUEDU*	0.0235	4.1933	4.0042	-0.0044
WIEDU*	0.0304	3.6528	3.1736	-0.0146
HUWIEDU*	-0.0036	15.3173	12.7075	0.0094
HHI	-0.0003	6.0975	6.3334	-0.0001
RMCP0*	0.0566	0.5056	0.5056	0.0000
WINDEX1	0.0062	4.2672	3.4287	-0.0052
LEFTCP0*	0.0400	1977.1109	1967.0000	-0.4046
F*	-0.0628	3.8162	4.0521	-0.0148
ERRF	0.0384	0.0000	0.0000	0.0000
SSTTHCP0*	-0.0139	20.9844	17.7717	0.0447
ELEC*	0.0806	0.4663	0.1408	-0.0262
PISL	-0.0006	3.9533	3.9533	0.0000
SANI*	0.0781	0.0967	0.0962	-0.0000
MUNI	0.0291	0.1326	0.0969	-0.0010
BANGKOK	0.0496	0.1095	0.0858	-0.0012
CENTRAL	-0.0248	0.1806	0.1878	-0.0002
NORTH*	-0.0613	0.2230	0.2323	-0.0006
SOUTH*	0.1417	0.1206	0.1246	0.0006
RCP0^ (Simulation)		0.7068	0.2736	-0.4332
% CHANGE RFCP0^				-61.29

fertility is quite important, contributing about 1.5 percent of the 3.3 percent decline (through increases in surviving children and household size). In fact, data from the censuses show that for children aged 15-19, the ratio of those who had completed grade 4 and continued in the formal education system increased by about 100 percent between 1970 and 1980 (i.e., the continuation rate doubled). Thus, our simulation may overstate the increase a little, though the census data are for the individual schooling continuation rate and our simulations are for the household average schooling continuation rate.

The simulation shows a substantial reduction in total household savings (and a 4.60 decline in the average savings rate) in 1970 compared with the base case. In the

Table 4.4 (Continued) Savings

Variable	Coeff.	Mean Whole Kingdom 1980	Mean Whole Kingdom 1970	Change
Constant	640.22396			
DINCOME*	0.6665	3827.0606	3075.0432	-501.2046
DINCOME2*	5.7500E + 07	1.4646E + 07	9.456E + 06	-2.9844
WEALTH*	-0.9936	464.0079	408.3270	55.3235
TOW	-0.2271	13.0412	13.0412	0.0000
AGRI	-148.30589	0.6593	0.7593	-14.8329
SOWNAGRI*	1046.30333	0.2538	0.3131	62.0511
SHOWN*	-575.66083	0.3849	0.4123	-15.7759
GOVERN*	-386.2684	0.1028	0.0524	19.4651
HUEDU*	-61.03376	4.1933	4.0042	11.5426
WIEDU	31.65529	3.6528	3.1736	-15.1707
HUWIEDU*	-12.89374	15.3173	12.7075	33.6501
MAGE	-51.79272	42.9796	42.9796	0.0000
MAGE2	0.51048	1847.2460	1847.2460	0.0000
HHI*	-243.05349	6.0975	6.3334	-57.3258
RCH05*	1171.43662	0.1039	0.1039	0.0000
RCH6*	893.48243	0.3220	0.3220	0.0000
RCH12*	309.88946	0.2456	0.2456	0.0000
SHDUR*	-3870.70435	0.0317	0.0317	0.0000
SHMEDC*	-3417.25981	0.0370	0.0370	0.0000
F	29.48509	3.8162	4.0521	6.9543
ERRF	3.19404	0.0000	0.0000	0.0000
RCP0	-442.84533	0.7193	0.2784	195.2336
ERRCP0	236.26638	0.0000	0.0000	0.0000
RGPPS*	749.11606	1.0467	1.1214	55.9847
PISL*	6.78052	3.9533	3.9533	0.0000
SANI	-127.97405	0.0967	0.0962	0.0656
MUNI*	-590.06094	0.1326	0.0969	21.0352
BANGKOK*	-1093.0978	0.1095	0.0858	25.9173
CENTRAL*	-736.24441	0.1806	0.1878	-5.3047
NORTH	-67.08002	0.2230	0.2323	-0.6281
SOUTH*	-762.13737	0.1206	0.1246	-3.0514
SAVINGS ^ (Simulation)		-69.8990	-198.9546	-129.0556
% CHANGE SAVINGS ^				-4.6435

Table 4.4 (Continued) Women's Hours Worked

Variable	Coeff.	Mean Whole Kingdom 1980	Mean Whole Kingdom 1970	Change
Constant	-32.488			
DINCOME*	0.0007	3827.0606	3075.0432	-0.5373
DINCOME2*	1.4E-09	1.4646E + 07	9.4559E + 06	0.0071
WEALTH*	-0.0014	464.0079	408.3270	0.0770
TOW	0.0278	13.0412	13.0412	0.0000
AGRI*	5.1198	0.6593	0.7593	0.5121
OWNWORK*	7.9542	0.5303	0.5681	0.3003
GOVERN*	-7.3322	0.1028	0.0524	0.3695
HUEDU*	-0.7240	4.1933	4.0042	0.1369
WIEDU	-0.0759	3.6528	3.1736	0.0364
HUWIEDU	0.0114	15.3173	12.7075	-0.0297
WAGE	4.0661	38.1158	38.1158	0.0000
WAGE2	-0.0498	1452.8142	1452.8142	0.0000
HHI*	2.1506	6.0975	6.3334	0.5072
RCH05*	-7.3219	0.1039	0.1039	0.0000
RCH6*	5.4920	0.3220	0.3220	0.0000
RCH12	1.5667	0.2456	0.2456	0.0000
SHDUR	-3.7063	0.0317	0.0317	0.0000
SHMEDC	-4.7931	0.0370	0.0370	0.0000
F	-4.8558	3.8162	4.0521	-1.1453
ERRF	2.2559	0.0000	0.0000	0.0000
RCP0	2.1332	0.7193	0.2784	-0.9404
ERRCP0	-1.3860	0.0000	0.0000	0.0000
RGPPS	1.0861	1.0467	1.1214	0.0812
PISL	-0.1079	3.9533	3.9533	0.0000
SANI*	-4.8561	0.0967	0.0962	0.0025
MUNI*	-14.9021	0.1326	0.0969	0.5312
BANGKOK*	-12.1534	0.1095	0.0858	0.2882
CENTRAL	2.5566	0.1806	0.1878	0.0184
NORTH	-0.4880	0.2230	0.2323	-0.0046
SOUTH	2.0500	0.1206	0.1246	0.0082
WHOUR ^ (Simulation)		51.0157	51.2348	0.2191
% CHANGE WHOUR ^				0.43

* = Significant at critical level 10%.

base year, total household savings averaged -70 baht per household for the Kingdom. In the simulations, they declined to -199 baht per household. It should be noted that it is usual for income and savings data in socioeconomic surveys to be much less than that in the national accounts.[24] The lower savings rate in the simulation for 1970 compared with the 1980 base year, however, is consistent with National Accounts data, which give a lower household savings rate in 1970 compared with 1980 (11.1% versus 13.6%).[25] As expected, the main source of lower savings in the simulations is the lower real level of household income. The indirect impact of the larger number of living children, through a larger household size, is also important, contributing to a decline in savings per household of 57 baht. On the other hand, the indirect impact of less schooling continuation is to make savings larger than otherwise, although it should be noted that the coefficient for this variable is not significant in the savings estimates.

The number of hours worked by women increases slightly in the simulation for 1970 compared with the base, and this increase also occurs for the rate of labor force participation. The latter is consistent with labor force participation data from the censuses.[26] Most of the exogenous changes led to an increase in the number of hours worked in 1970 compared with the base year. This is true for the occupational and locational variables, and the combined education of the man and woman. Income changes, however, led to a decline in the number of hours worked. The change in the number of children appears also to be negative, with the impact of the number of children leading to fewer hours worked; however, its indirect impact on household size leads to more hours worked, of a lesser magnitude. The change in schooling continuation leads to quite a large decline in the number of hours worked – by about 0.9 hours.[27]

Overall, the exogenous changes lead to changes in the four outcomes of interest that were in the same direction as those experienced historically in Thailand in the 1970s. It is interesting that, in many cases, the indirect impacts of the changes in the conditioning variables are quite important. This result reinforces our a priori observations about the complexity of the interrelationships between population and development. Changes in general economic developmental variables affect fertility choices of households, which in turn influence other facets of household behavior, with implications for the pattern of future development.

Chapter 5

Conclusions

We have empirically explored some of the key household behavioral relations underlying the interrelations between population and economic development in Thailand. We have specified and estimated a system of conditional demand functions to determine the number of surviving children, the postcompulsory schooling continuation rate, and household savings and the number of hours worked by women. The estimated relations indicate a number of interesting economic and demographic interactions, as well as some other important results. Among the latter, for example, is the apparent substitution between mother's and father's schooling in determining child schooling; we found no significant difference in the impact of the schooling of the two parents on either child schooling or on the number of surviving children. These results contrast with conventional wisdom (e.g., World Bank, 1981; Schultz, 1988b) regarding the primacy of women's schooling in affecting outcomes related to children. Another set of interesting results pertain to the differential impact of current income and of longer-run wealth (human as well as physical and financial) on the various outcomes – perhaps most interestingly, their opposite effects on savings.

We then used our estimated relations to simulate the impact on our four outcomes of three hypothetical exogenous changes. These simulations illustrate the nature of the interrelations among these outcomes, some regional differences in the transmission of the effects, and trade-offs between the number of surviving children and both child schooling and savings rates (and, to a lesser extent, the number of hours worked by women). More specifically, they indicate possibly important effects of incremental family planning expenditures and large effects of exogenous changes in the number of surviving children and in the general process of development. An exogenous increase in the number of children, for example, is simulated to considerably reduce schooling continuation rates and savings rates; the number of hours worked by women is affected less, but still perceptibly. Such changes may substantially alter general development prospects. The final simulation examines the impact of changes in the exogenous variables as experienced in Thailand between 1970 and 1980. The simulated changes in the four outcomes of interests conform in direction with the actual changes that took place in Thailand in the 1970's. These simulation results also demonstrate empirically the complexity of the relationships between population and development.

Appendix

Table A.1 Notation of Variables

Variable	Description	Unit
DINCOME	Disposable income	Baht/Month
DINCOME2	Disposable income squared	Baht/Month
WEALTH	Housing expense and property income	Baht/Month
TOW	Land area	Rai
AGRI	Dummy for agricultural household	
OWNWORK	Dummy for self-employed	
SHOWN	Proportion of household income from self-employment	
SOWNAGRI	Cross-product of proportion of income from self-employment and dummy for agricultural household	
GOVERN	Dummy for government employment	
HUEDU	Years of schooling of husband	Years
WIEDU	Years of schooling of wife	Years
HUWIEDU	Cross-product of schooling of husband and wife	
MAGE	Husband's age	Years
MAGE2	Husband's age squared	Years
WAGE	Wife's age	Years
WAGE2	Wife's age squared	Years
HHI	Number of household members	Persons
RCHO5	Proportion of children aged 0-5	
RCH6	Proportion of children aged 6-11	
RCH12	Proportion of children aged 12-14	
HSEXF	Dummy for female head of household	
RMCPO	Proportion of boys finishing compulsory education in household	
WINDEX1	Expected wage impact of schooling given share of boys in household	

Table A.1 (continued) Notation of Variables

Variable	Description	Unit
LEFTCPO	Average year of completing compulsory education	Years
SHDUR	Durable share in consumption	
SHMEDC	Drug and medicine share in consumption	
F	Number of surviving children	Persons
RCPO	Schooling continuation rate beyond compulsory education	
WHOUR	Women's hours worked in 1980-81	Hour/Week
SAVINGS	Household savings	Baht/Month
SSTTHCPO	Ratio of secondary student per teacher, when children finished Pratom 4	
NFPP	Government family planning expenditures per married woman aged 15-45	Baht/Person
DINCNFPP	Cross product of disposable income and government family planning expenditures	
RGPPS	Ratio of actual to predicted per capita provincial product in 1981	
WWGEDU	Average women wage for given education	Baht/Hour
ELEC	Dummy for household having electricity	
PISL	Proportion Islamic in province	Percent
SANI	Dummy for sanitary district	
MUNI	Dummy for municipal area	
NORTH	Dummy for North Region	
SOUTH	Dummy for South Region	
CENTRAL	Dummy for Central Region	
BANGKOK	Dummy for Bangkok Region	

Table A.2 Mean and Standard Deviations for Dependent and Right-side Variables

	Calculated from 5,821 HH.		Calculated from 2,243 HH.	
Variable	Mean	SD	Mean	SD
DINCOME	3,296.25	4,611.60	3,827.06	6,176.07
WEALTH	403.60	1,020.65	464.01	1,039.34
TOW	9.39	15.35	13.04	17.93
AGRI	0.63	0.48	0.66	0.47
OWNWORK	0.49	0.50	0.53	0.50
SOWNAGRI	-	-	0.27	0.29
SHOWN	-	-	0.38	0.29
GOVERN	-	-	0.10	0.30
HUEDU	4.58	2.81	4.19	2.53
WIEDU	4.01	2.39	3.65	2.08
HUWIEDU	22.27	31.26	18.05	23.68
MAGE	-	-	42.98	6.12
WAGE	31.98	7.35	38.12	4.63
HHI	-	-	6.10	1.73
RCH05	-	-	0.10	0.16
RCH6	-	-	0.32	0.25
RCH12	-	-	0.25	0.22
HSEXF	0.01	0.08	-	-
RMCPO	-	-	0.51	0.40
WINDEX1	-	-	4.27	2.35
LEFTCPO	-	-	1,977.11	2.83
SHDUR	-	-	0.03	0.17
SHMEDC	-	-	0.04	0.09
F	2.65	1.70	3.82	1.63
RCPO	-	-	0.72	0.38
WHOUR	-	-	51.81	22.08
SAVINGS	-	-	-45.37	5,384.76
SSTTHCPO	-	-	20.98	3.63
NFPP	5.77	3.87	-	-
RGPPS	-	-	1.05	0.07
WWGEDU	17.97	16.89	-	-
ELEC	0.44	0.50	0.47	0.50
PISL	4.69	14.52	3.95	12.56
SANI	0.10	0.29	0.10	0.30
MUNI	0.15	0.36	0.13	0.34
NORTH	0.24	0.43	0.22	0.42
SOUTH	0.13	0.33	0.12	0.33
CENTRAL	0.17	0.37	0.18	0.38
BANGKOK	0.13	0.34	0.11	0.31

Endnotes

1 National Academy of Sciences (1971) and (1986).

2 A number of these relationships have been estimated using the Thai Socioeconomic Survey data; e.g., fertility – Schultz (1988a); demand for education – Phananiramai and Mason (1987), Sussangkarn (1988a); saving – Mason, Woramontri and Kleinbaum (1987), and Paxson (1988). However, our analysis is the first to have estimated these relationships as a system using Thai data.

3 For examples see Becker (1981) and Willis (1973).

4 Prior to 1978 defacto compulsory education was for four years (lower elementary education). Subsequently, this was changed to six years. The children who had decided whether to continue beyond compulsory education (by the 1981 Socioeconomic Survey) mostly made this decision under the old system of four years of compulsory education. In our analysis, we take four years of primary education as the cutoff for compulsory education.

5 We emphasize that we are considering here and in our estimates the *household* average continuation rates. Since continuation rates are likely to be higher for households with fewer children, the mean *household* postcompulsory schooling continuation rate is likely to be above the *individual* rate. That in fact is the use. The latter is 0.57 from the 1981 SES.

6 In recent years, with compulsory education increasing to six years, the continuation rate beyond compulsory education is much less than the rates in Table 2 and is less than 50 percent for the Kingdom as a whole (see Phanamiramai and Mason 1987, and Kiranandana (1988). This is now widely considered to be a serious problem, and possibly a key constraint to the sustainability and equity of future development in Thailand (see Sussangkarn, 1988b and TDRI, 1988).

7 See Siamwalla (1988).

8 See, for example, Behrman and Birdsall (1983 and 1985).

9 As found, for example, in Behrman and Wolfe (1984).

10 For detailed analyses of family planning expenditures on fertility in Thailand see Schultz (1988a). Schultz included interactions between family planning expenditures and other variables as well. In our analyses, we also included most of the interactions in his paper, but found that most of these were insignificant. This suggests that in Schultz's study the interaction terms may be proxing for community and household characteristics that are not included in his specifications but are included in ours.

11 This is because we include both the ratio continuing on beyond compulsory education and the error term from the education relation as conditioning variables in the savings and women's hours worked relations.

12 Instead of only the latter as for surviving children.

13 This is consistent with the finding based on cross-country regression in Sussangkarn (1988a).

14 Not included in the calculation of current income from government employment.

15 This contrasts with the substitutability of the man's and woman's schooling in the schooling continuation relation.

16 See also the analysis of food shares in household consumption in Pattamakitsakul (1988).

17 This excludes time spent on housework.

18 Based on changes in adult literacy rates.

19 These imply that Bangkok was the only net gainer through migration between 1970 and 1980. Most of the migrants to Bangkok were from the Northeast.

20 The sum of the "CHANGE" column over the right-side variables is equal to the difference between the simulated prediction and the original prediction.

21 Calculated from the National Statistical Office (1970 and 1980).

22 Data from the Contraceptive Prevalence Surveys between 1981 and 1984 (see Kamnuansilpa and Chamratrithirong, 1981 and 1985), show that changes in mean number of children still living between the two CPS surveys were less than that for children ever born. However, the difference is not large.

23 With the changes associated with population distribution taken as a group.

24 These discrepancies may be due to more accurate data in socioeconomic surveys on consumption than for income, which tends to be under-reported. A comparison of the 1980-81 SES with the National Accounts indicates that wage income in the SES was slightly lower than in the National Accounts, but apparent under-reporting was particularly large for own-account households, especially in the non-farm sector. This pattern of under-reporting is to be expected. Paxson (1988) also suggests that the income and consumption data refer to different periods (i.e., the former for the past year, but the latter for the past month or less), with the income period earlier than that for consumption. This timing leads to an understatement of savings due to inflation.

25 From the National Economic and Social Development Board (1988). Although the household savings rate increased between 1970 and 1980, the rate has declined substantially in the 1980's. Previous analysis using macro time series suggests that inflation is an important determinant of the household savings rate, and that the inflation experience explains well the variation in the savings rate between 1960 and 1985; Sussangkarn and Cripps (1986).

26 In more recent years however, there has been a tendency for female labor force participation to increase, at least based on the data from the Labor Force Surveys from 1977 to 1984; see Sussangkarn, Ashakul and Myers (1986).

27 In absolute terms, the magnitude of the change from schooling continuation is larger than that for any other variable.

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Authors' Profiles

CHALONGPHOB SUSSANGKARN

Chalongphob Sussangkarn is the Director of the Human Resources and Social Development Program at TDRI. He received his B.A. and Ph.D. in Economics from Cambridge University, U.K. Before joining TDRI, he had taught at the University of California, Berkeley, and was an Economist at the World Bank, Washington D.C.

JERE R. BEHRMAN

Jere R. Behrman is the W.R Kenan, Jr. Professor of Economics at the University of Pennsylvania, USA. He has undertaken considerable research on various dimensions of economic development. He participated in this study and in related studies with the Human Resources and Social Development Program on the TDRI-HIID (Harvard Institute for International Development) Program funded by USAID.

YONGYUTH CHALAMWONG

Yongyuth Chalamwong is a Research Fellow of the Human Resources and Social Development Program at TDRI. He received his B.A. and M.S. in Agricultural Economics from Kasetsart University, and Ph.D. in Resources Economics from Pennsylvania State University, USA. Before joining TDRI, he was an Associate Professor of Agricultural Economics at Kasetsart University.

MATHANA PHANANIRAMAI

Mathana Phananiramai is an Associate Professor of Economics at Thammasat University and a consultant of the Human Resources and Social Development Program at TDRI. She received her B.A. in Statistics from Chulalongkorn University, M.A. in Statistics from Purdue University, and Ph.D. in Economics from the University of Hawaii.

PRAPON PATTAMAKITSAKUL

Prapon Pattamakitsakul was a Research Associate of the Human Resources and Social Development Program at TDRI. He received his B.A. in Agricultural Economics from Khon Kaen University, and M.S. in Agricultural Economics from Kasetsart University. Currently, he is working with the C.P. Group.

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